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# NUEXCO

SEPTEMBER 1982 NUMBER 169

# Monthly Report on the Uranium Market

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# MONTHLY REPORT ON THE URANIUM MARKET

September 1982 No. 169

R. WESLEY MILLER, *EDITOR*

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*FOREWORD*

Nuexco is pleased to announce the establishment of our European office. Staffed by Jim Vaughan, Vice President, and Katie Bowen, Regional Marketing Manager, the office will be formally opened as soon as we complete arrangements for office space and communications. In the meantime, any customers in Europe should feel free to contact Jim or Katie by telephone at 33-50-40-85-85. Katie and Jim may also be contacted through our representative in London,

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or our New York office, or our headquarters office in Menlo Park, California.

Nuexco's New York office is now staffed by Ken McCue, Vice President; Scott Hickman, Regional Marketing Manager; and Terry Elms Lindsay, Marketing Representative. Mrs. Lindsay was transferred to New York from California as of August 15.

Enclosed with this Report is a copy of a speech presented by Bob Wolcott at the Uranium Institute annual meeting on September 3, 1982 in London.

*MARKET ACTIVITIES*

## PRICING

The **Exchange Value** as of August 31, 1982 is $17.00 per pound $U_3O_8$, down $1.25 from last month's level of $18.25. During August, sellers continued their spirited competition for the few sales opportunities for spot and near-term delivery. US utilities liquidating unwanted inventories continued to participate in the market, but their influence may be waning. Such sellers still account for approximately two-thirds of the *active uranium supply* reported this month, but for only about one-fourth of the material involved in current transactions.

Active sellers are offering 1.7 million pounds $U_3O_8$ for sale in the near term, down from 2.6 million last month. However, since *active uranium demand* in the same time frame dropped from 1.0 million to only 160 thousand pounds $U_3O_8$, the supply-demand ratio rose sharply from 2.6:1 last month to 10.6:1 this month. The past three months' wild swings in that ratio (9.5 to 16.2 to 2.6 to 10.6) are the direct result of the market's thinness. Because there are so few active participants in the current market, the actions of one buyer or one seller can have disproportionate effects on the spot and near-term price for uranium. Therefore, the current *unstable* market has the potential for sharp price movements in either direction.

* * *

The *Market Data* section lists 10 uranium transactions this month. Although the market has been characterized for some time by sales from utilities to producers, especially in the US, it is interesting to note that the two largest transactions during August were US utility purchases from producers, one US and the other Canadian.

The importance to the market of utility sales to producers seems to be waning. For the fourth consecutive month, Nuexco has reported no sales from utilities to producers. DOE has reported that, during 1981:

1. Eight US utilities sold 2.8 million pounds $U_3O_8$ for 1981-1982 delivery;
2. Three US utilities loaned 0.6 million pounds $U_3O_8$;
3. US producers received approximately 75 percent of the combined total.

Thus, commercial transfers from US utilities to US producers during 1981 involved approximately 2.5 million pounds $U_3O_8$. So far, during 1982, Nuexco has reported only four sales, and no loans, from utilities to producers.

The total quantity falls in the range of 1.1-2.2 million pounds $U_3O_8$. Those sales all took place in the first quarter of this year.

* * *

The **Transaction Value** as of August 31, 1982, is $19.10 per pound $U_3O_8$, down $1.20 from a month ago. The current Transaction Value includes 14 transactions totaling 2.3 million pounds $U_3O_8$ and covers a period of 4 months.

* * *

The **Conversion Value** as of August 31, 1982, is $0.90 per pound U as $UF_6$, down ten cents from last month. Offers to sell conversion services in the near term are four times demand, 2.6 million to 650 thousand pounds U as $UF_6$. One conversion transaction closed during the month. Sellers of conversion services have indicated their willingness to sell at prices near the current Conversion Value, but interest on the part of buyers has been limited.

* * *

The **Loan Use Charge Rate** remained at six percent. Activity in the loan market in minimal. One large transaction is under negotiation and a few smaller transactions are in the preliminary phases of discussion.

## AUSTRALIA

The federal government has granted a mining lease to Pancontinental Mining Ltd. and its partner, Getty Oil Development Company, Ltd., for the Jabiluka uranium deposit. The project partners now hold mining title to the ore body and are permitted to proceed with mine and mill construction.

* * *

Exploration drilling for the quarter ended June 30, 1982 at the Westmoreland uranium prospect in Queensland amounted to 1646 meters of percussion drilling and 6890 meters of diamond bit drilling in 92 drill holes. The field season will conclude in mid-September and drill results may be known six weeks later. The project is owned by Queensland Mines, Ltd. (40 percent), CSR (12.7 percent), IOL Petroleum (9.8 percent), Urangesellschaft Australia Pty. Ltd. (37.5 percent).

* * *

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*MARKET ACTIVITIES*

The government, as part of its new budget initiative, will spend A$1,000,000 this year for a pilot plant to produce full-sized canisters of Syn-Roc. These funds will be provided to the Australian Atomic Energy Commission (AAEC) and will be in addition to a grant of A$230,000 this year for a Syn-Roc research facility at the AAEC's laboratories.

Syn-Roc is a method, developed in Australia, for the disposal of radioactive waste. It was developed by a research team under Professor Ringwood of the Australian National University, and has been tested for three years at the AAEC's laboratories. The AAEC claims that it has significant advantages over other waste disposal methods, and is up to five hundred times more effective than vitrification. Syn-Roc is reported to maintain its integrity under irradiation and to withstand exposure to high temperature water without releasing significant quantities of radioactivity.

The hope is to manufacture Syn-Roc on a large scale at a commercially attractive cost. The recent grant continues the government's support of this aspect of the nuclear fuel cycle.

* * *

In an address before the Australian Constitution Association, the Minister for Energy, Sir John Carrick, reiterated the official government position that:

1. Australia faces an energy problem unless nuclear power is accepted as an energy source.

2. Despite government plans to conserve coal and oil and its policy of encouraging exploration, nuclear power must eventually play a large part in electricity generation in Australia.

Sir John's remarks should be regarded not as a significant policy move, but as a reaffirmation of a policy that promotes the long-term use of nuclear power. Public support such as this from a prominent government figure is vital to the establishing and maintaining of a climate of public acceptance for nuclear power.

## EUROPE

In the **Federal Republic of Germany (FRG)**, two recently issued first-stage construction permits could signal the end of the five-year de facto moratorium on new nuclear construction. In July, the Bavarian Ministry for the Environment issued the FRG's first construction permit in five years to Bayernwerk for Isar Unit 2 sited at Ohu. The most recent had been that issued for Philippsburg Unit 2 in July 1977. Construction has already begun under the new permit. It was followed two weeks later, August 9, by Lower Saxony authorities' issuance of a first-stage construction permit for the Emsland nuclear unit, a 1,222 net MWe PWR sited at Lingen, to the unit's principal owner and operator, Vereinigte Elektrizitaetswerk Westfalien (VEW).

Some hope that the issuance of these two construction permits will be followed by as many as four or five more this year under the federal government's new "convoy" system. However, the next unit in the convoy is Biblis Unit C. Its principal owner and operator, Rheinisch-Westfaelisches Elektrizitaetswerk (RWE), probably will not receive a first-stage construction permit for that unit until late this fall, so the prevailing optimism is tempered by caution.

The convoy system was introduced in February and has been supported strongly by the German reactor construction firm Kraftwerk Union (KWU). The system's proponents hope it will allow the approval of reactor construction permits to take place with regularity. Its fundamental premise is that standard (generic) plant designs, once approved, need not be reviewed individually when used in other reactors under circumstances falling within the design parameters. Under the new system, legal and technical rulings made during license reviews are routinely extended to other cases. The system also speeds the implementation of design changes made after the license is issued.

At present, the FRG has twelve operating reactors, whose capacity totals 9.8 net GWe (gigawatts, electric). With the issuance of the two construction permits, there are ten units under construction, comprising 10.6 GWe. Thus, the reasonably assured nuclear capacity stands at 20.4 GWe. If, as expected, construction permits are granted promptly for several additional units under the convoy system, the FRG could have nuclear capacity of more than 25 GWe in operation by the end of this decade. However, simply reaching 20 GWe by that time would require doubling installed nuclear capacity in eight years, a not inconsiderable achievement.

* * *

In **France**, highlights from the recently released 1981 annual report for the Commissariat a l'Energie Atomique (CEA) are:

1. French mining companies spent 16 percent more on exploration in 1981 than in 1980, approximately 740 million francs or US$ 123 million.

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2. French uranium reserves remained stable at around 140,000 tonnes $U_3O_8$ as of January 1, 1982.

3. French domestic uranium production totalled 6.6 million pounds $U_3O_8$ in 1981, down 3 percent from 6.8 million in 1980. Of this amount, 4.9 million pounds are attributable to Cogema and 1.7 million to other companies, notably Dong Trieu and Minatome.

4. Abroad, uranium production from mines in Niger, Gabon and Canada in which French companies have shareholdings was 17.3 million pounds $U_3O_8$, of which 10.0 million pounds went to France.

In Niger, Somair's total production was 5.5 million pounds $U_3O_8$. Cominak produced a total of 5.9 million pounds $U_3O_8$.

In Gabon, Comuf produced 2.7 million pounds $U_3O_8$.

In Canada, total production from Cluff Lake amounted to 3.4 million pounds $U_3O_8$.

Highlights from Cogema's just published 1981 annual report:

1. Exploration expenditures declined by 10 percent as compared to 1980, but the program was generally sustained at high levels. Emphasis was shifted slightly, to increase spending on foreign and reduce domestic exploration. There was particular emphasis on Canada and Australia. Abroad, continued effort is being expended in Niger (Imouraren Project in association with Conoco and Onarem), in Gabon (notably with Korea Electric Company), in Mali, Senegal, in Canada (mostly Saskatchewan and Quebec), in the US (Texas), in Australia (Western Australia, South Australia and Queensland), and Guyana.

2. Domestically, Cogema mined 5.5 million pounds $U_3O_8$, but technical difficulties at the start of the new plant at Lodeve limited combined mill output to 4.9 million pounds.

3. Abroad, Cogema (through its 100 percent subsidiary Coginter) received 6.2 million pounds $U_3O_8$ from its share of mine production in Niger and Gabon (Somair, Cominak and Comuf) — which was just over 44 percent of their total production. In Texas, Framco, a wholly-owned subsidiary of Cogema, holds 25 percent of the Benavedes in-situ operation which continues to operate satisfactorily.

* * *

In **Spain**, Asco Unit 1 has cleared the last hurdle before fuel loading, startup and power generation. Spain's nuclear regulatory authority, the Consejo de Seguridad Nucleare (CSN) granted the necessary safety certification, so the Ministry of Industry provisionally authorized the unit's principal owner and operator, Fuerzas Electricas de Cataluna, S.A. (FECSA) to start up the 880 net MWe Westinghouse PWR. It is possible that FECSA, in order to avoid the steam generator problems encountered by Almaraz Unit 1, a similar Westinghouse unit, might choose to:

1. Operate the plant at only 50 percent of capacity.
2. Delay startup until Westinghouse decides whether steam generator modifications are required.

* * *

In the **United Kingdom** the CEGB has published the names of five sites for future nuclear power stations.

1. Hinkley Point in Somerset
2. Dungeness in Kent
3. Sizewell in Suffolk
4. Winfrith in Dorset
5. Druridge Bay in Northumberland

No order of precedence has been established, but Hinkley Point will probably be the next site after Sizewell B, for which the Board has already requested planning permission. Whether the reactors ordered for these new sites will be PWRs or AGRs has not yet been specified.

Hinkley Point, Dungeness and Sizewell would involve extensions of existing nuclear power station sites. Some of the other new sites which the CEGB had been investigating were ruled out because of its policy of building at least 2000 MWe of nuclear capacity on any new site.

## FAR EAST

The **Japan** Energy Economy Research Institute (JEERI) recently published its long range forecast of power supply. Particularly notable is the nuclear power forecast which differs substantially from previously established official government targets. JEERI forecasts that installed nuclear capacity in 1990 will be 38,000 MWe, constituting about 18 percent of energy supply. This compares to the official targets of 46,000 MWe and 22 percent. For the year 2000, JEERI forecasts 60,000 MWe and 25 percent, as opposed to official targets of 90,000 MWe and 30 percent.

Previous Nuexco Reports have indicated our opinion that the official targets are overly optimistic, given current lead times and siting difficulties. The JEERI forecast substantially agrees with those views. The

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differences between the JEERI forecast and the official targets are of such a magnitude that projecting Japan's future uranium needs must be approached with caution. The range of uncertainty is increased by Japanese plans to use:

1. LWR fuels having higher design fuel burnup;
2. Mixed oxide fuels.

Both actions could reduce uranium demand substantially in this century.

## UNITED STATES

Actions of two US uranium producers announced in August will contribute further to the decline in US uranium production in 1982.

1. Plateau Resources will be closing its Ticaboo, Utah mill immediately. At present, Plateau plans to resume full operations in late 1984 to meet contract commitments for 1985 deliveries.

2. Kerr McGee, the largest operating producer in the US, is reducing its Ambrosia Lake and Church Rock, New Mexico operations by about 30 percent.

Nuexco's current forecast of 1982 US uranium production is 25.7 million pounds; when final results are tabulated, the total will probably be lower than that amount. It is Nuexco's opinion that many producers will fall short of the production levels planned at the beginning of this year.

* * *

The US NRC issued a "conditional" full power operating license for Commonwealth Edison's LaSalle Unit 1. The license was conditional on a satisfactory review of workers' complaints of construction defects. The review was conducted, the plant's safety was verified, and the restriction was lifted.

* * *

One nuclear power plant was officially cancelled in August. Houston Lighting and Power will not build the Allens Creek unit. Two other utilities announced delays for nuclear units under construction. Responding to the Pennsylvania Public Utilities Commission's orders to cancel the unit, Philadelphia Electric decided to halt construction of Limerick Unit 2 until Limerick Unit 1's scheduled completion in 1987. The utility's plans now call for Limerick Unit 2 to begin operations sometime after 1990. Kansas Gas & Electric's Wolf Creek unit, delayed one year, is now scheduled to enter commercial operations in 1985.

* * *

Plant cancellations and delays are usually announced soon after the decisions are formally made. They also can be ascertained by reviewing public sources such as the World List of Nuclear Power Plants, published semi-annually in Nuclear News, the house organ of the American Nuclear Society. The latest edition, listing nuclear units that are operable, under construction or on order as of June 30, 1982 was published in August, 1982.

A comparison between the current list and that published in February, 1982 indicates that during the first six months of 1982, 15 US nuclear units which had been under construction or planned as of the end of 1981, were cancelled, indefinitely deferred, or delayed by at least one year. Those units are listed in Table 1.

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Table 1

**US NUCLEAR POWER UNITS CANCELLED, DELAYED OR INDEFINITELY DEFERRED DURING THE FIRST HALF OF 1982**

| Reactor | Utility | As of 12/31/81 | As of 6/30/82 |
|---|---|---|---|
| **Cancelled** | | | |
| Black Fox 1 | Public Service of Oklahoma | July 1991 | cancelled |
| Black Fox 2 | Public Service of Oklahoma | July 1994 | cancelled |
| Perkins 1-3 | Duke Power Co. | indefinite | cancelled |
| **Indefinitely deferred** | | | |
| Pebble Springs 1 | Portland G&E | September 1988 | indefinite |
| Pebble Springs 2 | Portland G&E | September 1990 | indefinite |
| Hartsville A1 | TVA | April 1991 | indefinite |
| Hartsville B2 | TVA | April 1992 | indefinite |
| Yellow Creek 1 | TVA | October 1990 | indefinite |
| WNP 3 | WPPSS | December 1986 | indefinite |
| **Delayed at least one year** | | | |
| Clinton 1 | Illinois Power Co. | August 1983 | August 1984 |
| Catawba 1 | Duke Power Co. | March 1984 | June 1985 |
| Catawba 2 | Duke Power Co. | September 1985 | June 1987 |
| Bellefonte 2 | TVA | February 1988 | November 1989 |
| River Bend 1 | Gulf States Utilities | April 1984 | December 1985 |
| Diablo Canyon 2 | Pacific Gas & Electric | — 1982 | — 1983 |

For the most part, these cancellations and delays have been well publicized. Of greater interest is the reported change in the "percent complete" column. There are 59 reactors actively under construction. They range from 100 percent to 4 percent complete.

Twenty of the 59 reported either no change or only a 1 point increase in percent complete. Several of these had been expected. For example, the South Texas Project has been changing project and construction engineers. Also, Pacific Gas & Electric's problems with Diablo Canyon Units 1 and 2 are well known.

Thus, 35 of the units under construction or on order as of the end of 1981, approximately 36 percent, experienced negative or essentially zero construction progress for the first half of this year.

* * *

Table 2 presents the US NRC's June estimate of the dates for issuance of reactor operating licenses. Since unforeseen construction or licensing delays cannot yet be taken into account, many of the projected issuance dates are based primarily on NRC's standard assumptions for licensing review times. The table is in chronological order by estimated operating license (OL) issuance date and has been modified to reflect events that have taken place since it was prepared. For example, the NRC issued the low-power OL for Susquehanna Unit 1 on July 17, 1982.

The NRC schedule calls for 37 nuclear units comprising 39.5 Gigawatts (GWe) to receive operating licenses during the period 1982-1986. The most recent Nuexco forecast, published in Report 164, calls for the addition of only 28.2 GWe over the same period. Table 3 shows a year by year comparison between the NRC estimate and the Nuexco forecast. Besides the substantial difference in the cumulative amounts, the two forecasts also differ substantially in timing. The NRC forecast calls for 30.7 GWe to be added to US capacity by the end of 1983, while the Nuexco forecast includes only 8.4 GWe in the corresponding period.

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**Table 2**

**US NRC ESTIMATE OF SCHEDULE FOR ISSUANCE OF OPERATING LICENSES**

| Utility | Reactor | Net MWe | Percent Construction Completed | Utility's Estimated Construction Completion Date | NRC Estimated OL Issuance Date |
|---|---|---|---|---|---|
| **1982** | | | | | |
| Southern California Edison | San Onofre 2 | 1100 | 100 | 2/82 | Full-pwr OL issued July, 1982 |
| Commonwealth Edison | LaSalle 1 | 1078 | 100 | 4/82 | Full-pwr OL issued Aug., 1982 |
| Mississippi Power & Light | Grand Gulf 1 | 1250 | 95 | 6/82 | Low-pwr OL issued June, 1982 |
| South Carolina Electric & Gas | Summer 1 | 900 | 98 | 7/82 | Low-pwr OL issued Aug., 1982 |
| Pennsylvania Power & Light | Susquehanna 1 | 1050 | 92 | 7/82 | Low-pwr OL issued July, 1982 |
| Florida Power & Light | St. Lucie 2 | 777 | 81 | 10/82 | 9/82 |
| Southern California Edison | San Onofre 3 | 1100 | 87 | 11/82 | 10/82 |
| Arizona Public Service | Palo Verde 1 | 1270 | 95 | 11/82 | 11/82 |
| Cincinnati Gas & Electric | Zimmer 1 | 810 | 97 | 12/82 | 11/82 |
| Louisiana Power & Light | Waterford 3 | 1104 | 94 | 1/83 | 12/82 |
| Commonwealth Edison | LaSalle 2 | 1078 | 84 | 1/83 | 12/82 |
| Pacific Gas & Electric | Diablo Canyon 2 | 1106 | 98 | 0/82 | 0/82 |
| **1982 Subtotal:** | 12 reactors = 12,623 MWe | | | | |
| **1983** | | | | | |
| Long Island Lighting | Shoreham 1 | 846 | 88 | 9/82 | 3/83 |
| Duke Power | McGuire 2 | 1180 | 94 | 4/83 | 3/83 |
| Commonwealth Edison | Byron 1 | 1120 | 79 | 4/83 | 4/83 |
| Texas Utilities | Comanche Peak 1 | 1150 | 89 | 6/83 | 5/83 |
| Detroit Edison | Fermi 2 | 1093 | 88 | 6/83 | 5/83 |
| Union Electric | Callaway 1 | 1150 | 78 | 6/83 | 5/83 |
| Consumers Power | Midland 2 | 807 | 74 | 7/83 | 7/83 |
| Tennessee Valley Authority | Watts Bar 1 | 1177 | 80 | 8/83 | 7/83 |
| Washington Public Power | WPPSS 2 | 1100 | 88 | 9/83 | 8/83 |
| Tennessee Valley Authority | Bellefonte 1 | 1213 | 79 | 9/83 | 8/83 |
| Cleveland Electric | Perry 1 | 1205 | 81 | 11/83 | 10/83 |
| Arizona Public Service | Palo Verde 2 | 1270 | 75 | 11/83 | 10/83 |
| Kansas Gas & Electric | Wolf Creek | 1150 | 80 | 12/83 | 11/83 |
| Public Service Co. of N.H. | Seabrook 1 | 1150 | 59 | 11/83 | 11/83 |
| Consumers Power | Midland 1 | 522 | 74 | 12/83 | 12/83 |
| Illinois Power | Clinton 1 | 933 | 83 | 1/84 | 12/83 |
| Pennsylvania Power & Light | Susquehanna 2 | 1050 | 65 | 1/84 | 12/83 |
| **1983 Subtotal:** | 17 reactors = 18,116 MWe | | | | |

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*MARKET ACTIVITIES*

| Utility | Reactor | Net MWe | Percent Construction Completed | Utility's Estimated Construction Completion Date | NRC Estimated OL Issuance Date |
|---|---|---|---|---|---|
| **1984** | | | | | |
| Tennessee Valley Authority | Watts Bar 2 | 1177 | 60 | 8/84 | 7/84 |
| Duke Power | Catawba 1 | 1145 | 88 | 10/84 | 9/84 |
| Philadelphia Electric | Limerick 1 | 1055 | 68 | 10/84 | 10/84 |
| Texas Utilities | Comanche Peak 2 | 1150 | 57 | 12/84 | 11/84 |
| Carolina Power & Light | Harris 1 | 900 | 55 | 12/84 | 11/84 |
| **1984 Subtotal:** | 5 reactors = 5,427 MWe | | | | |
| **1985** | | | | | |
| Gulf States Utilities | River Bend 1 | 934 | 43 | 4/85 | 3/85 |
| Commonwealth Edison | Braidwood 1 | 1120 | 61 | 4/85 | 4/85 |
| **1985 Subtotal:** | 2 reactors = 2,054 MWe | | | | |
| **1986** | | | | | |
| Houston Lighting & Power | South Texas 1 | 1250 | 45 | 12/86 | 11/86 |
| **TOTAL 1982-1986:** | 37 reactors = 39,470 MWe | | | | |

Sources: 1. NRC's Montly Status Report to Congress, June 30, 1982
2. Nuclear Power Plants Construction Status Report, Data as of 12/31/81 (yellow book)

**Table 3**

**FORECAST ANNUAL ADDITIONS TO US NUCLEAR GENERATING CAPACITY**
**(Thousands of MWe)**

| | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|
| USNRC[1] | 12.6 | 18.1 | 5.4 | 2.1 | 1.3 |
| Nuexco[2] | 3.9 | 4.5 | 5.7 | 8.9 | 5.2 |

[1]This Report, Table 2
[2]Nuexco Report 164, Table 5

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## URANIUM SUPPLY

| Nuexco Reference Number | Delivery Period[1] (Thousands of Pounds $U_3O_8$) 0 to 1 Year | Beyond 1 Year | Remarks |
|---|---|---|---|
| **Available for Sale:** | | | |
| **ACTIVE** | | | |
| 1575 | | 500 | Long Term |
| 1610 | 150 | | |
| 1818 | | 250 | Long Term |
| 1845 | 160 | | |
| 1877 | 50 | | |
| 1900 | 800 | | some $UF_6$ |
| 1932 | 300 | | |
| 1970 | 40 | | $UF_6$ |
| 1973 | 15 | | |
| 1976 | 180 | | |
| 1986 | 40 | | |
| TOTAL: | 1,735 | | |
| **INACTIVE** | | | |
| 1581B | | 150 | Long Term |
| 1664 | 100 | | |
| 1774 | 50 | | |
| 1804 | 600 | | |
| 1805 | | 500 | Long Term |
| 1920 | 3,000 | | |
| 1925 | 500 | | $UF_6$ |
| 1928 | 1,000 | | $UF_6$ |
| 1951 | 1,250 | | |
| TOTAL: | 6,500 | | |

[1]Measured from the date of this Report

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*MARKET DATA*

## URANIUM DEMAND

| Nuexco Reference Number | Delivery Period[1] (Thousands of Pounds $U_3O_8$) 0 to 1 Year | Beyond 1 Year | Remarks |
|---|---|---|---|
| **Inquiries to Purchase:** | | | |
| **ACTIVE** | | | |
| 1638 | | 250 per year | 1983-89 |
| 1843 | | 250 | |
| 1871 | | 250 per year | 1983-86 |
| 1915 | | 500 | $UF_6$ |
| 1933 | 160 | | |
| 1945 | | 500 | |
| 1964 | | 500 | |
| TOTAL: | 160 | | |
| **INACTIVE** | | | |
| 1459 | | 200 per year | Long Term |
| 1652 | | 200 per year | Long Term |
| 1888 | | 500 per year | Long Term |
| 1923 | 30 | | |
| 1935 | | 400 | |
| 1963 | | 180 | |
| 1966 | 100 | 200 | |
| 1978 | | 500 per year | 1985-94 |
| 1979 | 30 | 175 per year | 1983-93 |
| 1996 | | 420 | |
| 1999 | | 50 per year | 1985-90 |
| TOTAL: | 160 | | |

[1]Measured from the date of this Report.

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INTENTIONAL
BLANK

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## CONVERSION SUPPLY

| Nuexco Reference Number | Delivery Period[1] (Thousands of Pounds U as UFs) 0 to 1 Year | Beyond 1 Year | Remarks |
|---|---|---|---|
| **ACTIVE** | | | |
| 1584 | 550 | 300 per year | Long Term |
| 1607 | 600 | | |
| 1609 | 500 | 1,5[illegible] per year | Long Term |
| 1925 | 450 | | |
| 1936 | 200 | 200 per year | Long Term |
| 1983 | 300 | | |
| TOTAL: | 2,600 | | |
| **INACTIVE** | | | |
| 1619 | | 300 | |
| 1840 | ,300 | | |
| 1902 | | 350 | |
| TOTAL | 300 | | |

## CONVERSION DEMAND

| Nuexco Reference Number | Delivery Period[1] (Thousands of Pounds U as UFs) 0 to 1 Year | Beyond 1 Year | Remarks |
|---|---|---|---|
| **ACTIVE** | | | |
| 1594 | 400 | | |
| 1622 | 250 | 700 | |
| TOTAL: | 650 | | |
| **INACTIVE** | | | |
| 1594 | | 450 per year | Long Term |
| TOTAL: | 0 | | |

[1]Measured from the date of this Report.

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## LOAN SUPPLY AND DEMAND

| Nuexco Reference Number | Delivery Period[1] (Thousands of Pounds $U_3O_8$) 0 to 1 Year | Beyond 1 Year | Remarks |
|---|---|---|---|
| **Available for Loan:** | | | |
| **ACTIVE** | | | |
| 1742 | 500 | | |
| 1815 | 1,000 | | |
| 1919 | 3,000 | | |
| 1931 | 600 | | |
| 1938 | 2,000 | | |
| TOTAL: | 7,100 | | |
| **INACTIVE** | | | |
| 1884 | 275 | | |
| 1910 | 1,000 | | |
| 1939 | 800 | | |
| TOTAL: | 2,075 | | |
| **Inquiries to Borrow:** | | | |
| **ACTIVE** | None | | |
| **INACTIVE** | None | | |

[1]Measured from the date of this Report

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*MARKET DATA*

## CURRENT TRANSACTIONS[1]

### Uranium Transactions

| Nuexco Reference Number | Delivery Period | Approximate Quantity (thousands of pounds, $U_3O_8$ equivalent) | Approximate Price as Percent of Current E.V. | Seller | Buyer | Remarks |
|---|---|---|---|---|---|---|
| 1894 | 1982-83 | 101-300 | — | US Utility | European Utility | Definitive price info not available |
| 1901 | 1982 | 101-300 | 97 | US Producer | US Utility | |
| 1909 | 1982 | 51-100 | 96 | US Producer | US Utility | |
| 1910 | 1985-89 | 501-1000 | indeterminate | Canadian Producer | US Utility | Price related to market |
| 1911 | 1985-89 | 601-1000 | indeterminate | US Producer | US Utility | Price related to market |
| 1912 | 1982 | 51-100 | 107 | US Producer | US Producer | |
| 1915 | 1983 | 301-600 | 100 | US Utility | US Utility | |
| 1916 | 1982 | less than 50 | 103 | US Producer | US Producer | |
| 1917 | 1986-87 | 301-600 | indeterminate | US Producer | US Utility | |
| 1923 | 1982 | 101-300 | 121 | US Producer | US Producer | |

### Conversion Transactions

| Nuexco Reference Number | Delivery Period | Approximate Quantity (thousands of pounds, U equivalent) | Approximate Price as Percent of Current C.V. | Seller | Buyer | Remarks |
|---|---|---|---|---|---|---|
| 1924 | 1982 | 101-300 | 111 | US Utility | US Utility | |

[1]Transactions listed are not limited to those in which Nuexco was involved, but also include others of which Nuexco is aware.

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*ESSAY*

## URANIUM PRICING — AN AUSTRALIAN PERSPECTIVE

The Australian government uranium policy released in 1978 established extensive controls over most aspects of marketing, development and export of uranium. That policy has three important objectives:

1. To support Australia's policy regarding international nuclear safeguards and, in so doing,
2. To foster public acceptance of uranium mining, milling and export;
3. To ensure that Australian producers receive "realistic market prices and fair contract conditions."

The federal government:

1. Controls the timing and conditions of a seller's entry into the market;
2. Requires the inclusion of certain commercial terms and conditions in all export contracts;
3. Determines limits on foreign investment for each project;
4. Establishes regulations designed to protect the environment;
5. Specifies conditions to protect the interests of local Aboriginal groups.

The Minister for Trade and Resources is required to determine minimum terms and conditions of sales contracts. These include:

1. the duration of the contract;
2. the quantity of uranium sold;
3. pricing terms and conditions; and
4. the end use for the uranium under the contract.

The government issues these "Determinations" before a seller is permitted to negotiate with potential buyers. Each Determination defines the limits within which a particular Australian seller may negotiate. If the seller does not comply with the Determination, the Minister will not approve the contract. The government maintains that this procedure leaves sufficient room for realistic commercial negotiations to take place.

The approved pricing mechanism involves a floor price, 55 percent of which is escalated on the basis of Australian cost indices for labor and materials. The actual floor price is confidential to the seller receiving a Determination, but it is no secret in industry circles that the present level of the standard floor price is approximately US$15 per pound $U_3O_8$ above the current Nuexco Exchange Value.

Australian producers have had no choice but to accept these procedures. Although the producers initially thought the government was intervening too much in the private sector, their views changed as spot prices weakened and eventually fell below the floor price. Recognizing the protective effects of the floor price, those producers holding contracts for large portions of the production capacities of their newly constructed mills adopted a more positive attitude towards the government's policy.

Now, in a time of acute market weakness, the government-enforced floor price promotes the economic health of Australia's two *operating* production centers, Nabarlek and Ranger. If the government were to remove or lower the floor price to conform to current spot price trends, it could very well undermine the price of uranium under all Australian export contracts. Therefore, both industry and government consider the maintenance of the floor price to be in their best interests.

Even developers of new projects for which no export contract has yet been negotiated, for example, Pancontinental and Western Mining, do not oppose the pricing mechanism. Their rationale is simple. Under the pressures of inflation and high costs of capital, they need to obtain prices at least equal to the government-approved price level to ensure the viability of their projects. As a result, Australian producers are virtually unanimous today in their support for the maintenance of the floor price.

From Australia's perspective, the present policy makes sense at least in the near term. It ensures high profitability to existing producers and makes potential buyers aware that the price for new uranium production from Australia must approach the incentive price needed for new developments. Otherwise, the investment would not be worth making and would better be postponed. The overriding attitude is summed up in the words of a senior politician, "We don't want to encourage projects that will end up bankrupt."

At the same time, government officials monitor market movements closely, always ready to offer policy advice to Ministers should there arise a need to revise the policy. So far, they are not persuaded that the floor price concept has actually prevented sales of Australian uranium. Their conviction is not universal. MIT's Thomas Neff observes, "If utilities can satisfy their needs for some years through the spot market, it is more likely that the price barrier will break."

Recent reports in the trade press have suggested that some dilution of the floor price concept is already occurring. Those reports have implied that the government allows producers to grant the buyer, once agree-

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ment on the floor price is reached, a holiday on escalation.

It is understandable that both government and producers are eager to squeeze every inch of leeway out of the present floor price policy without actually changing it, and why it has been successful. Since 1978, when Australia began to sell under the present policy, almost 100 million pounds $U_3O_8$ have been sold under long-term contracts. Furthermore, any change in its uranium policy could prove politically embarrassing to present government.

These are strong inducements. Preserving the present policy, the government maintains, has helped to create a healthier market. This belief, in turn, has strengthened the resolve to persist. Producers have operating mines certainly agree. Some support it as an economic and political expedient. Others justify it on the basis that the sales in the long-term market do not rest so much on contract price. They see long-term sales more as a function of the larger political patterns in the world which shape the perceptions of utilities in respect of their future security of uranium supply.

Developers of new mines who regard the long-term market as their opportunity do not lobby for overt change either. They believe the present floor price will simply become irrelevant. Major new uranium developments will require prices higher than the present floor price in order to meet cash needs and meet financing costs.

This partly explains why Australian producers have remained calm in the face of falling spot prices. Also, they see in this trend their opportunity to displace eventually some higher cost production elsewhere. Admittedly, some companies are more vulnerable than others if the development periods for their projects are extended further, perhaps even into the next decade. Failure to meet their targets will be blamed less on the floor price policy than on prolonged lead times. As a result of socio-political conditions, their ambitions have now slipped out of phase with demand.

Developers still display undiminished optimism, despite their underlying knowledge that they do not control their own destinies. Only the strategic choices of farsighted utilities with large, long-term uranium requirements will initiate new developments. Producers recognize their dependence on large forward purchase commitments at prices that make sense to the financial institutions which will be asked to fund their development plans. Not every uranium project will succeed in this limited market. Once the choices are made, the remaining projects face even longer delays.

For the uncommitted Australian producers, the past is still too vivid for comfort. They were ready to enter the market back in 1976, but political obstacles caused them to miss the peak of the producers' market dominance.

A thirty-year-old provision in the Australian laws had classified uranium as "a prohibited substance." Its export needed specific government approval which only emerged very slowly from successive Australian governments, both Liberal and Labor. Environmental legislation arrived four years after the discovery of Australia's extensive uranium deposits.

In 1975, the Ranger Environmental Inquiry under Justice Fox, which was to set the policy framework for the uranium industry, began its deliberations. Its largely negative conclusions were published two years later. Although public sentiment against uranium had diminished, it still demanded further study. One more year passed before the government published (in 1978) its policy regarding the export of Australian uranium. By then it was almost too late.

Meanwhile, customers who were buying during that period for long-term deliveries in the 1980s had obtained supplies elsewhere. The inability of Australia's producers to sell uranium from future developments had contributed to buyers' feverish pursuit of other sellers during those years. When Australian uranium companies finally were free to market, they encountered substantially diminished interest in their products.

Although Ranger and Nabarlek, the first projects to receive government export approval, had been able to sell their future production at good prices, the tide had turned in favor of the buyers. As they saw it, the proverbial boat which had been expected to take this new sector of the Australian mining industry into a prosperous future had left other Australian producers standing at the dock.

Now, uncommitted producers face an acutely oversupplied market at diminished prices; a strong demand for their production is largely a fond memory of the past. They are afraid the remaining demand will not allow more than one additional project to proceed in the foreseeable future. With this experience behind them, uncommitted producers are more preoccupied with the fear of "missing the boat" again than with a change in the floor price concept.

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*MARKET ANALYSIS*

## US MARKETING ACTIVITY

### Introduction

The US Department of Energy (DOE) recently released its annual "Survey of United States Uranium Marketing Activity," assessing supply, demand and prices in the US uranium market during 1981. Confirming Nuexco's previous observations, the DOE report found, among other things, that:

1. This is a buyer's market in which the use of optional delivery schedules and floor prices is increasing.
2. US utilities are using increasing amounts of imported uranium.
3. Unfilled requirements and uncommitted production are declining.

### Pricing

The average US buyer's *contract price*, as reported by DOE, was $32.20 per pound $U_3O_8$ in 1981. Table 4 lists the corresponding price for each year since DOE began publishing such information.

**Table 4**

**AVERAGE US BUYER CONTRACT PRICES AND MARKET PRICE SETTLEMENTS**

| Year | Price per Pound $U_3O_8$ (Year of delivery dollars) |
|---|---|
| 1975 | 10.50 |
| 1976 | 16.10 |
| 1977 | 19.75 |
| 1978 | 21.60 |
| 1979 | 23.85 |
| 1980 | 28.15* |
| 1981 | 32.20* |

*Includes settlements of market price contracts. The 1981 data do not include uranium delivered under litigation settlements.

The average contract price reported by DOE *includes* settlements of market price contracts but *excludes* uranium delivered under litigation settlements. The 1981 average includes data for only 60 percent of the relevant material delivered to US buyers. Some prices had not been determined as of January 1, 1982; some prices were not reported to DOE.

At $24.19 per pound $U_3O_8$, the average 1981 Nuexco Exchange Value is considerably less than the average DOE reported contract price. The most important reason is that the DOE reported contract price includes deliveries under old contracts. The year to year increases in the average DOE price reflect the continuous expiration of deliveries under pre-1975 lower price contracts and the greater weight of higher priced agreements entered into in the 1975-1979 period. Another factor, of course, is that the Nuexco Exchange Value represents the market for spot and near-term deliveries and, as such, reflects the lower prices prevailing during 1981.

### Delivery Commitments

Over the past several years, the number of US nuclear power plants under construction and on order has decreased dramatically. Low growth rates for electricity demand and high interest rates have forced some utilities to delay, defer indefinitely, or cancel plans for nuclear power plants. The result has been an unprecedented decrease in the need for uranium. As indicated in Table 5, uranium delivery commitments for the years 1981-1990 declined significantly during 1981. Delivery commitments for the years 1991-2000 increased only slightly, even though utilities have begun to arrange for new uranium contracts to cover those years.

**Table 5**

**URANIUM DELIVERY COMMITMENTS**
**(short tons $U_3O_8$)**

| Delivery Year | As of 1/1/81 | As of 1/1/82 | Percent Change |
|---|---|---|---|
| 1981 | 175,500 | 173,800 | -1.0 |
| 1982 | 193,000 | 186,700 | -3.3 |
| 1983 | 208,900 | 199,500 | -4.5 |
| 1984 | 222,800 | 211,800 | -4.9 |
| 1985 | 234,500 | 223,500 | -4.7 |
| 1986 | 244,600 | 234,300 | -4.2 |
| 1987 | 253,300 | 244,300 | -3.6 |
| 1988 | 261,300 | 253,800 | -2.9 |
| 1989 | 269,100 | 263,100 | -2.2 |
| 1990 | 275,800 | 271,600 | -1.5 |
| 1991-2000 | 315,200 | 317,700 | +1.0 |

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**Optional Deliveries**

During 1981, US utilities more than tripled the amount of material on which they hold options. The data on optional deliveries point to two significant factors. First, in view of delays experienced to date, it is to be expected that utilities want to maximize flexibility in delivery schedules as new contracts are signed and older contracts renegotiated. Second, with prices down and uranium supply in excess of demand, this is a buyer's market. Buyers are in a better position to negotiate flexibility and options into their contracts as sellers compete for the limited business. Table 6 shows annual optional deliveries as of January 1, 1982, compared against the data from a year earlier.

**Table 6**

**ANNUAL OPTIONAL DELIVERIES**
**(short tons $U_3O_8$)**

| Year | As of 1/1/81 | As of 1/1/82 | Percent Change |
|---|---|---|---|
| 1982 | 400 | 200 | - 50 |
| 1983 | 500 | 400 | - 20 |
| 1984 | 600 | 800 | + 33 |
| 1985 | 300 | 500 | + 67 |
| 1986 | 300 | 1,700 | +467 |
| 1987 | 300 | 2,300 | +667 |
| 1988-98 | 4,200 | 16,300 | +288 |
| TOTAL: | 6,600 | 22,200 | +236 |

**Floor Prices**

Inflationary pressures and high interest rates have placed US uranium producers in the difficult position of attempting to make a profit in a market characterized by decreasing prices and increasing costs. To protect themselves from the cost-price squeeze, producers attempt to contract with floor prices whenever possible. Utilities, in order to obtain long-term delivery contracts with US producers, have in some cases accepted such pricing mechanisms. Table 7 indicates that, on balance, US market activity in 1981 led to an increased percentage of material committed under market price contracts having a floor price.

**Table 7**

**PERCENT OF MARKET PRICE CONTRACT COMMITMENTS HAVING FLOOR PRICES**

| Delivery Year | As of 1/1/81 | As of 1/1/82 | Percent Change |
|---|---|---|---|
| 1982 | 70 | 73 | + 4 |
| 1983 | 55 | 75 | +36 |
| 1984 | 50 | 72 | +44 |
| 1985 | 56 | 73 | +30 |
| 1986 | 68 | 70 | + 3 |
| 1987 | 81 | 59 | -27 |
| 1988 | 100 | 70 | -30 |
| 1989 | 94 | 75 | -20 |
| 1990 | 72 | 78 | + 8 |

The DOE survey does not indicate what portion, if any, of these contracts have clauses allowing the buyers to terminate if the market price were to drop below the floor price. In today's market, contracts are being negotiated with a wide variety of mechanisms to allow either buyer or seller or both to obtain full or partial relief in that case.

**Imports**

Reflecting the concern of US uranium producers over US utilities' use of uranium of other than US origin, the US Congress is debating some type of uranium import limitation. At present, two conflicting bills are in the House-Senate Conference Committee awaiting the end of the Labor Day recess. Table 8 shows that, during 1981, US import commitments for delivery over the next ten years increased by more than two-thirds.

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**Table 8**

**US IMPORTS OF URANIUM FOR COMMERCIAL USE**
**(short tons $U_3O_8$)**

| Delivery Year | As of 1/1/81 | As of 1/1/82 | Percent Change |
|---|---|---|---|
| 1981 | 1,900 | — | — |
| 1982 | 1,800 | 3,800 | +111 |
| 1983 | 1,800 | 2,300 | + 28 |
| 1984 | 2,100 | 2,900 | + 38 |
| 1985 | 2,100 | 3,300 | + 57 |
| 1986 | 1,300 | 3,100 | +138 |
| 1987 | 1,200 | 2,500 | +108 |
| 1988 | 1,200 | 2,500 | +108 |
| 1989 | 1,200 | 2,400 | +100 |
| 1990 | 1,200 | 2,000 | + 67 |
| 1991 | — | 1,700 | — |
| TOTAL: | 15,800 | 26,500 | + 68 |

In 1981, 15 US utilities and one other US company delivered uranium of other than US origin to DOE enrichment plants. Canada was the most prominent exporter to the US; ten of the sixteen companies reported Canada was the origin of some or all of their imported material. Five companies imported material from France, three from South Africa, and one from Australia. Three listed the source as unknown.

DOE also requests that utilities state their policies on buying material originating outside the US. Those policies are summarized in Table 9. The results indicate an increased willingness to consider importing uranium, but at the same time an increased preference for domestic supplies. It can be surmised that market developments have forced consideration of non-US purchases, but recognition of that reality has crystallized US utilities' preference for domestic sources. US utilities are in the somewhat awkward position of wanting to support US producers to assure a viable domestic uranium supply, but at the same time having to satisfy price-conscious ratepayers and regulatory authorities.

**Table 9**

**VIEW OF US UTILITIES ON PROCUREMENT OF FOREIGN-ORIGIN MATERIAL**

| | As of 1/1/81 | As of 1/1/82 |
|---|---|---|
| Utilities replying | | |
| Utilities included | 60 | 58 |
| No reply | na | 3 |
| Policy | | |
| No specific policy | 26 | 29 |
| Prefer domestic | 7 | 13 |
| Have limit on foreign | 27 | 16 |
| Plans to purchase foreign | | |
| Will not | 1 | 0 |
| Unlikely | 4 | 7 |
| Uncertain | 20 | 7 |
| Possible | 33 | 42 |
| Current plans include buying | 2 | 2 |

**Uncommitted US Production**

It comes as no surprise that the DOE survey found a marked decline in material available for sale by US producers. Some companies have placed operating mines and mills on standby until the uranium market situation improves. Other companies have curtailed production. Planned projects are being deferred or cancelled. Future startup dates and production rates of any of these operations are uncertain at this time. Table 10 summarizes the results of producer data on uncommitted production.

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*MARKET ANALYSIS*

**Table 10**

**UNCOMMITTED URANIUM US PRODUCERS ESTIMATE WILL BE AVAILABLE FOR SALE**
**(short tons $U_3O_8$)**

| Year | As of 1/1/81 | As of 1/1/82 | Percent Change |
|---|---|---|---|
| 1981 | 2,500 | — | — |
| 1982 | 2,800 | 2,800 | 0 |
| 1983 | 4,200 | 3,800 | -10 |
| 1984 | 5,500 | 1,600 | -71 |
| 1985 | 6,800 | 1,800 | -74 |
| 1986 | 6,900 | 2,900 | -58 |
| 1987 | 6,400 | 3,100 | -52 |
| 1988 | 6,600 | 3,400 | -49 |
| 1989 | 5,300 | 3,600 | -32 |
| 1990 | 5,400 | 3,600 | -33 |
| 1991 | — | 3,500 | — |
| TOTAL: | 52,400 | 30,100 | -43 |

**Inventories**

Table 11 lists US utility inventory positions, showing both natural and enriched material. In 1981, eight utilities sold material for 1981-82 delivery and three made loans, with 75 percent of the sales and loans going to uranium producers. This reinforces previous Nuexco reports that producers are opting to buy uranium to meet commitments rather than produce it.

**Table 11**

**URANIUM INVENTORIES HELD BY US BUYERS AS OF 1/1/82**
**(short tons $U_3O_8$)**

| Type | Utilities | All Buyers |
|---|---|---|
| Natural | 44,100 | 51,200 |
| Enriched | 8,700 | 11,200 |
| TOTAL: | 52,800 | 62,400 |

**US Utility Unfilled Requirements**

The data collected on unfilled US utility uranium requirements is summarized in Table 12. Although there are a few years in which the amount increases, generally the amounts are declining. The obvious conclusions are that utilities are contracting for uranium supplies in the future and units are being cancelled and deferred, thereby reducing annual uranium requirements.

**Table 12**

**UNFILLED US UTILITY URANIUM REQUIREMENTS**
**(short tons $U_3O_8$)**

| Year | As of 1/1/81 | As of 1/1/82 | Percent Change |
|---|---|---|---|
| 1981 | 100 | — | — |
| 1982 | 500 | 300 | -40 |
| 1983 | 1,000 | 1,600 | +60 |
| 1984 | 2,600 | 2,600 | 0 |
| 1985 | 3,500 | 3,100 | -11 |
| 1986 | 3,800 | 4,300 | +13 |
| 1987 | 7,500 | 5,400 | -28 |
| 1988 | 10,600 | 6,200 | -42 |
| 1989 | 12,500 | 9,100 | -27 |
| 1990 | 12,400 | 9,500 | -23 |
| 1991 | — | 9,900 | — |
| TOTAL: | 54,500 | 52,000 | -5 |

Single copies of DOE's "Survey of United States Uranium Marketing Activity," July 1982, can be obtained by writing to:

S.V. Krusiewski
NE 32
US Department of Energy
Washington, D.C. 20545

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*RAW MATERIALS*

## URANIUM OCCURRENCES IN SWEDEN

### Introduction

The Swedish government initiated a uranium exploration program in the 1950s. The agency AB Atomenergi and designated private mining companies conducted extensive prospecting, primarily in the southern part of the country. The exploration effort concentrated on the bituminous black shales scattered throughout the south-central region. It was soon determined that low grade uranium was consistently dispersed throughout certain shale deposits. In the early 1960s, the government acknowledged the discovery of a low grade deposit containing an estimated 1,000,000 tonnes $U_3O_8$ in bituminous shale at Ranstad. At the time, it was considered one of the largest uranium deposits in the world.

The government considered that Sweden would be self-sufficient in uranium with the reserves at Ranstad and reaffirmed its policy decision to include a nuclear power base as an important part of Sweden's energy supply system. The initial nuclear power program was later expanded to include 13 units having a combined capacity of 10,460 MWe. The nine units presently operating have a total capacity of 6,400 MWe. The three units presently under construction are scheduled to begin operations by 1985. The construction permit for the 13th unit was never issued and the program was contracted to its present size of 12 units. The 12 units, when all are operational, will have a combined generating capacity of 9,410 MWe.

Uranium requirements for the 12 units are calculated at approximately three million pounds $U_3O_8$ per year. Although there is discussion in Sweden of phasing out the nuclear program by the year 2000, it is likely that more than 60 million pounds $U_3O_8$ will be consumed in the interim. The stated purpose of the exploration program was to fulfill Sweden's total uranium demand from domestic resources. When economic and environmental issues slowed development of the Ranstad deposit, the government accelerated uranium exploration in other geologic environments in an attempt to offset the need to purchase foreign uranium. Certain exploration programs remain active today, operating under the provisions of state-controlled exploration permitting and licensing procedures.

### Exploration History

The responsibility for uranium exploration was reassigned to the Geological Survey of Sweden (SGU) in 1967. At the beginning of the exploration program, SGU was organized to conduct various aspects of exploration from regional reconnaissance to final evaluation and calculation of ore reserves. The techniques of uranium exploration were coordinated with the already established techniques used for other minerals, including geophysical and geochemical methods. The integration of different techniques greatly enhanced the development of new radiometric instrumentation and calibration procedures and the capabilities for computerized data collection and interpretation.

The Swedish Nuclear Fuel Supply Company (SKBF), formed in 1973 for the purpose of coordinating nuclear fuel supplies for the Swedish nuclear program, was also given overall responsibility for uranium exploration and presently directs all activities of SGU. Their working relationship in Sweden's joint minerals program has proved successful in several different geologic environments.

Glacial drift covers much of the basic geology of Sweden by a thickness of from less than one meter up to tens of meters. The techniques developed by the SGU for "reading" the drift material as to direction and distance of movement and the source of mineralized boulders contained therein have proved to be quite useful for prospecting. A variety of radon detection methods were developed and used with varying degrees of success; however, till-spectrometry proved the most effective exploration tool in drift environment.

Airborne and ground geophysics are used by the SGU as initial prospecting tools. Radiometric, magnetic and electromagnetic survey methods have been integrated to gain maximum information with each application. Geophysical anomalies are computerized for rapid interpretation, followed by on-site evaluation of separate anomalies. Ground electromagnetic and magnetic measurements are extremely useful to detect the distribution of shear zones and fracture patterns at various depths, especially where glacial drift covers the rock formation. Mineralization is commonly associated with such geologic features; thus, the early recognition of their occurrence often leads to favorable prospects.

Follow-up evaluation of a prospect includes detailed geophysical and geochemical surveys. On-site geologic studies of rock types and their relationship to structural features are carried out when the prospect area is not covered by glacial drift. If the evaluation shows favorable economic potential, the area of interest is trenched or core drilled to obtain samples for assaying. Radiometric logging of each drill hole is a necessary part of the

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evaluation program. Mineable ore reserves are calculated and the deposit is categorized as to its economic status. Project development is the next consideration. It is common practice for a private mining company to carry out all mining and processing of commercial ores.

During the course of the exploration program, SKBF has had an exploration license, or application for a license, on as many as 15 different potential areas at one time. Each licensed exploration area is usually identified with the nearest community. Exploration and evaluation activities often proceed without outside opposition. The right to mine uranium, either as the primary mineral or co-mineral, is subject to special government provisions, but final approval must come from the community. The decision by the community has precedence over government approval and a negative vote by a community can stop a development program.

**Uranium Occurrences**

There are 40 or 50 known occurrences of uranium mineralization throughout the areas already prospected in Sweden. About two-thirds of the shows are associated with other minerals in veins, fractures and faults in Precambrian rocks; the remaining occur in bituminous shales, plus intrusive and metamorphic rocks of post-Precambrian age. A great deal of the country remains to be prospected. There are excellent opportunities for additional discoveries, especially in the north portion of Sweden. Figure 1 is a map of Sweden showing the location of known uranium occurrences.

Only three or four occurrences have been considered for mining due primarily to orebody characteristics and prevailing economics. The first important discovery was at Ranstad where it was determined that a uranium-rich portion of bituminous shale represented one of the world's largest low-grade uranium deposits. Remnants of bituminous shales are scattered throughout southern Sweden and many are known to contain uranium. However, the Ranstad occurrence is the most promising because of its size and consistency of uranium content.

**Ranstad**

The uranium-bearing zone at Ranstad occurs in the upper portion of a shale series of Upper Cambrian age. The shale is horizontal and covers an area of about 500 square kilometers. Uranium occurs as an indistinct mineral in association with a phosphatic-organic zone which is 2.5 to 4.0 meters thick. The uranium content varies from 0.025 to 0.035 percent $U_3O_8$. Total uranium resources for the deposit are calculated at 1,000,000 tonnes $U_3O_8$, of which 300,000 tonnes are considered technically recoverable.

When the Ranstad occurrence was evaluated, it appeared that Sweden could supply all its domestic uranium requirements from the one deposit. A pilot mine and mill project was initiated in 1965, but after producing about 500,000 pounds $U_3O_8$, operations were terminated. The project proved to be uneconomic at the time, and the plan to mine an extremely high volume of shale was unacceptable to the public.

The government proposed to renew the project in 1975 and designated the state-owned mining company Luossavaara-Kiirunavaare AB (LKAB), AB Atomenergi and SKBF to conduct the recovery operation under the management of LKAB. The purpose of the project was to test the latest technology of large scale mining and recovery chemistry. Approximately 6,000,000 tonnes of ore were to be mined and processed annually. The project was again cancelled for essentially the same reasons stated above.

The Ranstad deposit contains at least nine minerals in addition to uranium, some of which are of economic importance. The deposit is therefore considered one of the most important sources of raw material in Sweden. In yet another attempt to develop the deposit, two of the largest mining companies in Sweden, Boliden AB and LKAB, formed a joint development and holding company, Aktiebolaget Svensk Alanskifferutveckling (ASA). Its purpose was to mine the deposit for uranium and other minerals, starting in early 1978. ASA requested from the government a license to mine and process 1,000,000 tonnes shale per year. The existing pilot plant was to be modernized to process full production by 1980. However, the project was formally rejected by the councils of two nearby communities in late 1977. The rejection could not be appealed by the mining companies and almost immediately, LKAB began to look elsewhere for another uranium project to put into operation.

**Pleutajokk**

In October 1980, LKAB applied for a license to mine and process uranium at the Pleutajokk deposit near the community of Arjelog. The SGU discovered uranium in the area of 1969. During the next 10 years, about 22 small deposits were discovered in the vicinity and the uranium potential of the new district was estimated at approximately 20,000 tonnes $U_3O_8$. Established reserves at the Pleutajokk deposit total about 4,000 tonnes $U_3O_8$.

The LKAB application, which has since been rejected

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**Figure 1**

**URANIUM OCCURRENCES OF SWEDEN**
**Numbered Occurrences Are Described In Text.**

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by local community reaction, was to mine the Pleutajokk deposit first and surrounding deposits second. The mineralization occurs as pitchblende and uraninite in veins, fractures and fault zones throughout a portion of volcanic and granitic rocks. The mineralization is estimated to be about 1800 million years (m.y.) in age compared to 1900 m.y. estimated for the host rock. The rock has been metamorphosed and ore-forming solutions are considered the source of mineralization, the placement of which was associated with the late stages of metamorphism.

The ore was to be mined by open pit and underground methods; 300 tonnes $U_3O_8$ per year were to be produced by conventional acid leach/solvent extraction technology. The plan included the mining of smaller deposits in the immediate vicinity of Pleutajokk. The project has been indefinitely postponed.

**Others**

Private prospectors discovered uranium in the Olden Window district located west of the community of Hotagen in 1972. The SGU investigation of the district revealed a number of scattered occurrences in at least three different rock environments. The two largest occurrences show mineral concentration in Precambrian granite. The most important one is located in the northeast corner of the window. Known as the Lilljuthatten deposit, the uranium is concentrated in fractures and breccia zones within a highly altered portion of the Olden granite.

The source of the uranium was probably the granite. Uranium occurs widely disseminated throughout the granite. During periods of metamorphism, hydrothermal solutions may have leached uranium from the granite mass only to transport and concentrate it within altered and fractured zones in the granite.

The deposit contains about 1900 tonnes of ore limited to a zone that measures approximately 225 x 100 x 50 meters. The average grade of deposit is 0.14 percent $U_3O_8$. The main uranium minerals are pitchblende and coffinite; secondary uranium minerals occur on fracture faces where alteration is most intense. The mineralization has been age-dated at about 420 m.y. compared to about 1650 m.y. for the granite.

A second deposit is located in the northwest portion of the Olden Window. Known as the Sjaule deposit, the uranium occurs in veins filling vertical joints in granite and highly fractured quartz porphyry. The main ore zone is about 280 meters long x 20 meters wide. Pitchblende is the main uranium mineral present. The $U_3O_8$ content of this small deposit is thought to be less than the Lilljuthatten deposit. However, mode of origin and concentration are thought to be the same.

There are other uranium occurrences scattered throughout the Olden Window. Uranium occurs in veins and fractures of altered metavolcanics and diabase dikes. Age and origin of the mineralization is considered the same as that of the larger deposits.

Uranium mineralization has been discovered in calcareous sandstone-shale sediments near the community of Tasjo in central Sweden. Uranium mineralization is up to six meters thick in a highly folded sandstone host rock. The uranium content is about double that found in the bituminous shale beds. The host formation overlies the shale beds and is considered as Upper Cambrian in age. It has been determined that the chemical composition of the ore is complex and for that reason, the evaluation program has second order priority.

A number of other uranium occurrences scattered throughout Sweden remain to be investigated, such as those in the Bodsjo-Edsbyn district where uranium-rich veins were discovered in quartzites and gneisses of Precambrian age. However, investigation of uranium occurrences has been de-emphasized according to a recent political decision and plans to continue exploration are under consideration.

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*STATISTICAL DATA*

**EXCHANGE VALUE $17.00/lb. $U_3O_8$**
Determined as of August 31, 1982

**Definition**[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

**Derivation**

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

**Comments**

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.
B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

[1]In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

**TRANSACTION VALUE**[2]
Determined as of August 31, 1982

| $/lb. $U_3O_8$ | Millions of Pounds | Number of Transactions | Number of Months |
|---|---|---|---|
| 19.10 | 2.3 | 14 | 4 |

**Definition**

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for $U_3O_8$ in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds $U_3O_8$ are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

[2]Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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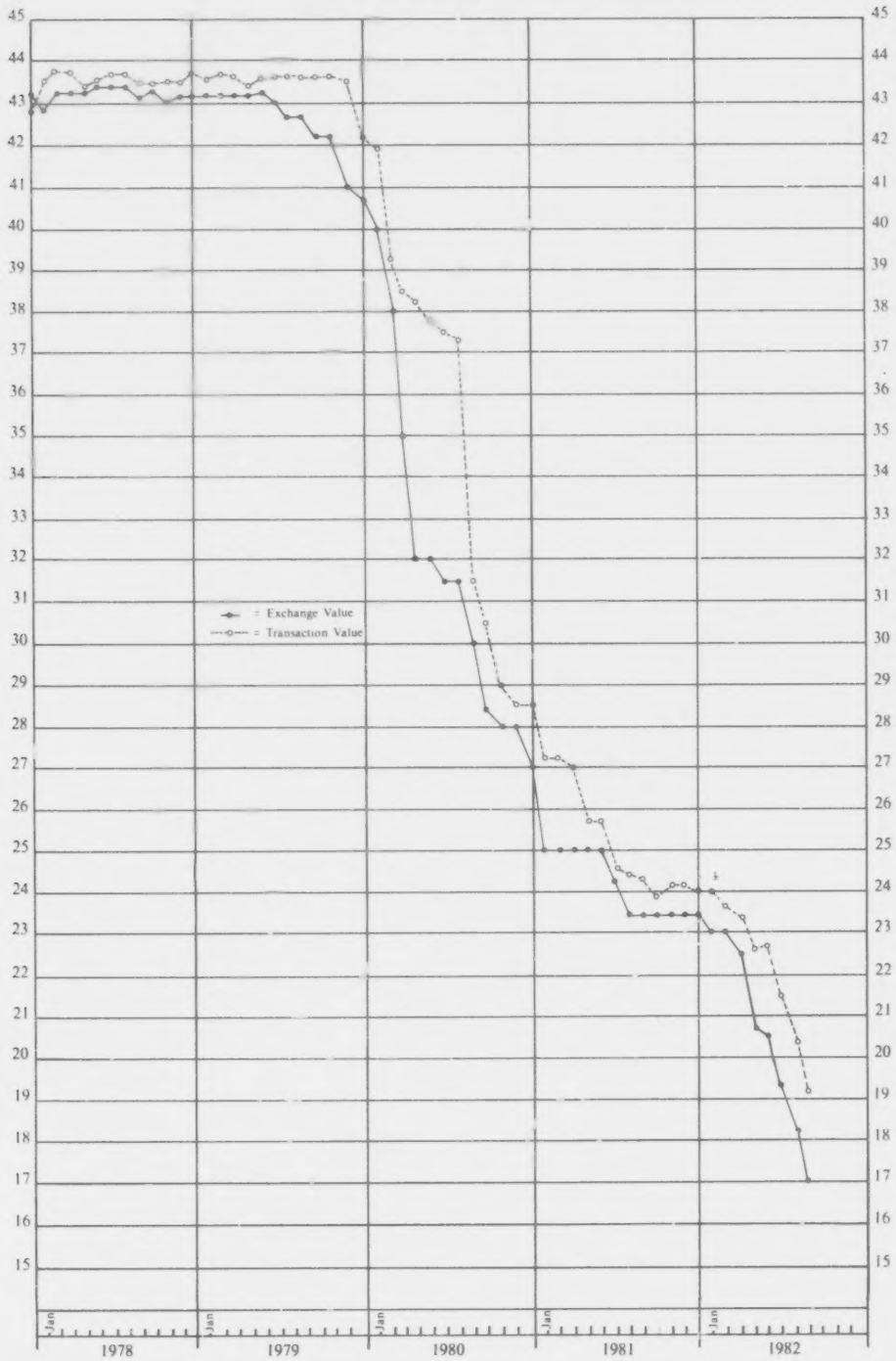
*STATISTICAL DATA*

## EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated

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*STATISTICAL DATA*

## HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. $U_3O_8$)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1968 | — | — | — | — | — | — | — | 6.35 | 6.35 | 6.40 | 6.45 | 6.50 |
| 1969 | — | 6.35 | 6.10 | 6.10 | 6.25 | 6.25 | 6.20 | 6.20 | 6.15 | 6.15 | 6.15 | 6.20 |
| 1970 | 6.30 | 6.30 | 6.30 | 6.30 | 6.30 | 6.30 | 6.30 | 6.20 | 6.15 | 6.15 | 6.15 | 6.15 |
| 1971 | 6.20 | 6.20 | 6.20 | 6.20 | 6.15 | 6.05 | 6.00 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 |
| 1972 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 |
| 1973 | 5.95 | 6.00 | 6.10 | 6.20 | 6.45 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 | 6.75 | 7.00 |
| 1974 | 7.70 | 7.90 | 8.00 | 9.00 | 9.50 | 10.50 | 11.50 | 12.00 | 12.50 | 14.00 | 14.75 | 15.00 |
| 1975 | 16.00 | 16.00 | 18.00 | 20.00 | 21.00 | 23.00 | 24.70 | 26.00 | 26.00 | 28.50 | 30.00 | 35.00 |
| 1976 | 35.20 | 37.00 | 39.25 | 40.00 | 40.00 | 40.00 | 40.00 | 40.40 | 41.00 | 41.00 | 41.50 | 41.00 |
| 1977 | 41.35 | 41.50 | 41.60 | 41.60 | 42.00 | 42.25 | 42.25 | 42.25 | 42.40 | 42.75 | 43.20 | 43.20 |
| 1978 | 42.90 | 43.25 | 43.25 | 43.25 | 43.40 | 43.40 | 43.40 | 43.10 | 43.25 | 43.00 | 43.25 | 43.25 |
| 1979 | 43.25 | 43.25 | 43.25 | 43.25 | 43.25 | 43.00 | 42.70 | 42.70 | 42.20 | 42.20 | 41.00 | 40.75 |
| 1980 | 40.00 | 38.00 | 35.00 | 32.00 | 32.00 | 31.50 | 31.50 | 30.00 | 28.50 | 28.00 | 28.00 | 27.00 |
| 1981 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 24.25 | 23.50 | 23.50 | 23.50 | 23.50 | 23.50 | 23.50 |
| 1982 | 23.00 | 23.00 | 22.50 | 20.75 | 20.50 | 19.25 | 18.25 | 17.00 | | | | |

## HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. $U_3O_8$)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1976 | — | — | — | — | 39.60 | 39.70 | 39.70 | 40.40 | 40.30 | 40.60 | 40.70 | 40.70 |
| 1977 | 41.30 | 41.30 | 41.40 | 41.50 | 42.80 | 42.90 | 43.00 | 42.60 | 42.50 | 42.80 | 42.90 | 42.90 |
| 1978 | 43.10 | 43.30 | 43.70 | 43.60 | 43.60 | 43.20 | 43.30 | 43.40 | 43.40 | 43.60 | 43.40 | 43.70 |
| 1979 | 43.60 | 43.80 | 43.70 | 43.40 | 43.60 | 43.70 | 43.70 | 43.60 | 43.60 | 43.60 | 43.50 | 42.30 |
| 1980 | 42.00 | 39.30 | 38.60 | 38.40 | 37.90 | 37.60 | 37.30 | 31.60 | 30.60 | 29.00 | 28.70 | 27.70 |
| 1981 | 27.20 | 27.20 | 27.00 | 25.70 | 25.70 | 24.50 | 24.40 | 24.30 | 23.90 | 24.10 | 24.10 | 24.00 |
| 1982 | 24.00 | 23.70 | 23.40 | 22.60 | 22.70 | 21.50 | 20.30 | 19.10 | | | | |

## EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

| Country | per lb. $U_3O_8$ in Concentrates | per kg $U_3O_8$ in Concentrates | per kg U in Concentrates |
|---|---|---|---|
| US (dollar) | 17.00 | 37.48 | 44.20 |
| France (franc) | 119.21 | 262.82 | 309.93 |
| FRG (mark) | 42.61 | 93.93 | 110.77 |
| Japan (yen) | 4,432 | 9,770 | 11,521 |
| Switzerland (franc) | 36.44 | 80.34 | 94.74 |
| UK (pound) | 9.93 | 21.90 | 25.82 |
| Australia (dollar) | 17.61 | 38.82 | 45.78 |
| Canada (dollar) | 21.09 | 46.49 | 54.82 |
| Niger, Gabon (CFA) | 5,965 | 13,150 | 15,507 |
| South Africa (rand) | 19.60 | 43.20 | 50.95 |
| Sweden (kroner) | 103.72 | 228.67 | 269.65 |

[1]Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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*STATISTICAL DATA*

**CONVERSION VALUE $0.90/lb. U as $UF_6$**
Determined as of August 31, 1982

**Definition**

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

**Derivation**

Nuexco bases the Conversion Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

**Comments**

Nuexco does not consider the following in determining the Conversion Value:
A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

**LOAN USE CHARGE RATE[1] 6%**
Determined as of August 31, 1982

**Definition**

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

**Derivation**

Nuexco bases the Loan Use Charge Rate upon:
A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

[1]Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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*STATISTICAL DATA*

## AUSTRALIAN GOVERNMENT STATISTICS

| | Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1] | Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2] |
|---|---|---|
| Annual Avg. 1971[3] | 101.5 | 65.95 |
| Annual Avg. 1972[3] | 105.6 | 71.26 |
| Annual Avg. 1973[3] | 124.4 | 78.96 |
| Annual Avg. 1974[3] | 141.9 | 108.07 |
| Annual Avg. 1975[3] | 150.4 | 132.55 |
| Annual Avg. 1976[3] | 168.4 | 160.93 |
| Annual Avg. 1977[3] | 192.0 | 179.03 |
| Annual Avg. 1978[3] | 198.5 | 190.04 |
| Annual Avg. 1979 | 248.8 | 196.34 |
| Annual Avg. 1980 | 321.8 | 218.00 |
| Annual Avg. 1981 | 355.3 | 238.18R |
| Mar 1981 | 355.2 | 229.66 |
| Apr 1981 | 354.6 | 229.38 |
| May 1981 | 353.4 | 237.31 |
| Jun 1981 | 360.4 | 237.93 |
| Jul 1981 | 356.9 | 237.86 |
| Aug 1981 | 359.9 | 237.86 |
| Sep 1981 | 357.4 | 238.00R |
| Oct 1981 | 351.6 | 239.26 |
| Nov 1981 | 351.3 | 241.48R |
| Dec 1981 | 349.9 | 268.39R |
| Jan 1982 | 354.9 | 260.40R |
| Feb 1982 | 356.7 | 261.74R |
| Mar 1982 | 360.3 | 261.91R |
| Apr 1982 | 368.1R | 261.76R |
| May 1982 | 367.9P | 262.02R |
| Jun 1982 | 367.6P | 262.84R |

P = Preliminary  R = Revised since last month

[1]Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.
[2]Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.
[3]Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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*STATISTICAL DATA*

## CANADIAN GOVERNMENT STATISTICS

| | Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0) | Wage-earner Data: Average Hourly Earnings (C$)[3] [4] | | |
|---|---|---|---|---|
| | | Metal Mining, including Milling (SIC 050-059) | Primary Metal Industries, non-ferrous (SIC 296-298) | Chemicals and Chemical Products (SIC 370-379) |
| Annual Avg. 1978 | 190.4 | 8.76 | 6.82 | 6.97 |
| Annual Avg. 1979 | 217.9 | 9.60 | 7.35 | 7.67 |
| Annual Avg. 1980 | 247.2 | 10.59 | 8.05 | 8.50 |
| Annual Avg. 1981 | 272.3P | 12.02 | 9.03 | 9.53 |
| Jun 1981 | 272.3 | 11.80 | 9.16 | 9.57 |
| Jul 1981 | 274.3 | 11.92 | 9.20 | 9.62 |
| Aug 1981 | 276.2 | 11.83 | 9.15 | 9.63 |
| Sep 1981 | 276.9 | 12.47 | 9.22 | 9.77 |
| Oct 1981 | 279.3 | 12.78 | 9.35 | 9.91 |
| Nov 1981 | 278.8 | 12.89 | 9.45 | 9.89 |
| Dec 1981 | 280.0 | 12.96R | 9.42 | 10.03 |
| Jan 1982 | 281.9 | 13.49R | 9.53 | 10.11 |
| Feb 1982 | 283.4 | 13.61R | 9.60 | 10.19 |
| Mar 1982 | 284.6 | 13.34P | 9.62P | 10.35 |
| Apr 1982 | 287.4 | 13.42P | 9.78P | 10.46P |
| May 1982 | 288.7 | — | — | — |
| Jun 1982 | 289.9P | — | — | — |
| Jul 1982 | 290.5P | — | — | — |

P = Preliminary R = Revised since last month

[1]Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2]Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3]Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4]Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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*STATISTICAL DATA*

## REPUBLIC OF SOUTH AFRICA STATISTICS

| | Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1] | Consumer Price Index[2] (1975 = 100, except where otherwise indicated) | Wholesale Price Index All Groups (1975 = 100) | Total Employment in Mining and Quarrying (Code 35)[5] | Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5] |
|---|---|---|---|---|---|
| Annual Avg. 1971[3] | 7.88 | 106.4[4] | 59.1 | 652,294 | 415,956 |
| Annual Avg. 1972[3] | 8.79 | 113.3[4] | 63.9 | 623,067 | 443,933 |
| Annual Avg. 1973[3] | 10.51 | 124.1[4] | 72.3 | 684,743 | 572,133 |
| Annual Avg. 1974[3] | 13.18 | 138.5[4] | 85.3 | 674,140 | 761,596 |
| Annual Avg. 1975[3] | 16.71 | 157.2[4] | 100.0 | 639,473 | 1,003,617 |
| Annual Avg. 1976[3] | 19.30 | 174.7[4] | 115.1 | 671,240 | 1,212,983 |
| Annual Avg. 1977[3,6] | 23.87 | 194.4[4] | 130.0 | 712,006 | 1,420,670 |
| Annual Avg. 1978[3,6] | 27.14 | 137.2 | 142.7 | 664,571 | 1,537,169 |
| Annual Avg. 1979[3,6] | 30.18 | 155.3 | 164.5 | 692,209 | 1,830,632 |
| Annual Avg. 1980[6] | 35.53 | 176.7 | 192.1 | 714,379 | 2,279,615 |
| Annual Avg. 1981 | 41.89 | 203.5 | 218.3 | 728,506 | 2,820,505 |
| Jan 1981 | — | 191.0 | 207.2 | 729,575 | 219,969 |
| Feb 1981 | — | 193.8 | 209.8 | 725,647 | 210,275 |
| Mar 1981 | 39.26 | 195.2 | 209.9 | 705,010 | 210,151 |
| Apr 1981 | — | 196.4 | 211.6 | 719,674 | 217,124 |
| May 1981 | — | 197.7 | 213.2 | 726,869 | 219,880 |
| Jun 1981 | 40.41 | 200.0 | 215.3 | 728,506 | 237,049 |
| Jul 1981 | — | 204.6 | 218.4 | 735,839 | 249,080 |
| Aug 1981 | — | 208.0 | 222.6 | 722,684 | 245,817 |
| Sep 1981 | 43.28 | 211.6 | 224.6 | 724,604 | 251,502 |
| Oct 1981 | — | 213.4 | 227.0 | 717,918 | 248,159 |
| Nov 1981 | — | 214.8 | 229.4 | 720,255 | 253,044 |
| Dec 1981 | 44.52 | 216.3 | 230.4 | 709,612 | 257,655 |
| Jan 1982 | — | 217.6 | 233.1 | 700,375 | 257,173 |
| Feb 1982 | — | 220.2 | 236.8 | 705,992 | 250,191 |
| Mar 1982 | 45.49 | 225.2 | 237.4 | — | — |
| Apr 1982 | — | 228.9 | 241.9 | — | — |
| May 1982 | — | 230.3 | 244.8 | — | — |

[1]Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.
[2]Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."
[3]Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.
[4]April 1970 = 100.00.
[5]Bulletin of Statistics, Department of Statistics, Pretoria.
[6]Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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*STATISTICAL DATA*

## US GOVERNMENT STATISTICS

| | Producer Price Index—Industrial Commodities (1967 = 100)[1] | Producer Price Index—all Commodities (1967 = 100)[1] | Consumer Price Index (1967 = 100)[2] | GNP Implicit Price Deflator (1972 = 100)[3] | Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4] | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Metal Mining (SIC 10) | Primary Non-ferrous Metals (SIC 333) | Chemicals and Allied Products (SIC 28) | Electric and Electronic Equipment (SIC 36) |
| Annual Avg. 1971[5] | 114.1 | 114.0 | 121.3 | 96.02 | 4.12 | 4.15 | 3.97 | 3.49 |
| Annual Avg. 1972[5] | 117.9 | 119.1 | 125.3 | 100.00 | 4.56 | 4.59 | 4.26 | 3.71 |
| Annual Avg. 1973[5] | 125.9 | 134.7 | 133.1 | 105.80 | 4.84 | 4.98 | 4.51 | 3.91 |
| Annual Avg. 1974[5] | 153.8 | 160.1 | 147.7 | 116.02 | 5.44 | 5.63 | 4.88 | 4.21 |
| Annual Avg. 1975[5] | 171.5 | 174.9 | 161.2 | 127.15 | 6.13 | 6.24 | 5.39 | 4.64 |
| Annual Avg. 1976[5] | 182.4 | 183.0 | 170.5 | 133.71 | 6.76 | 6.87 | 5.91 | 4.96 |
| Annual Avg. 1977[5] | 195.1 | 194.2 | 181.5 | 141.70 | 7.28 | 7.67 | 6.43 | 5.39 |
| Annual Avg. 1978[5] | 209.4 | 209.3 | 195.4 | 152.05 | 8.23 | 8.56 | 7.02 | 5.82 |
| Annual Avg. 1979[5] | 236.5 | 235.6 | 217.4 | 165.46 | 9.27 | 9.50 | 7.60 | 6.32 |
| Annual Avg. 1980[5] | 274.8 | 268.8 | 246.8 | 177.36 | 10.27 | 10.63 | 8.30 | 6.95 |
| Annual Avg. 1981 | 304.1 | 293.4 | 272.4 | 193.71 | 11.55 | 11.98 | 9.12 | 7.62 |
| Aug 1981 | 307.2 | 296.2 | 276.5 | — | 11.84 | 12.10 | 9.19 | 7.73 |
| Sep 1981 | 307.4 | 295.7 | 279.3 | 195.61 | 12.10 | 12.70 | 9.38 | 7.75 |
| Oct 1981 | 309.0 | 296.1 | 279.9 | — | 12.08 | 12.44 | 9.37 | 7.80 |
| Nov 1981 | 309.3 | 295.9 | 280.7 | — | 12.12 | 12.48 | 9.42 | 7.83 |
| Dec 1981 | 310.0 | 295.8 | 281.5 | 200.10 | 12.08 | 12.45 | 9.53 | 7.90 |
| Jan 1982 | 311.8 | 298.3 | 282.5 | — | 12.19 | 12.66 | 9.68 | 8.02R |
| Feb 1982 | 311.6 | 298.6 | 283.4 | — | 12.22 | 12.61 | 9.68 | 8.09R |
| Mar 1982 | 311.0 | 298.0R | 283.1 | 203.68 | 12.29 | 12.69 | 9.71 | 8.01 |
| Apr 1982 | 309.9P | 297.9P | 284.3 | — | 12.23 | 12.68 | 9.81 | 8.03 |
| May 1982 | 309.5P | 298.6P | 287.1 | — | 12.25R | 12.71R | 9.83R | 8.05R |
| Jun 1982 | 310.7P | 299.4P | 290.6 | 206.35P | 12.29P | 12.91P | 9.95P | 8.11P |
| Jul 1982 | 313.0P | 300.6P | 292.2 | — | — | 11.42P | 10.04P | 8.17P |

P = Preliminary R = Revised since last month

[1]US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2]US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3]US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4]US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5]Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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*FIGURES OF THE MONTH*

| | This Month | Last Month | 12 Months Ago |
|---|---|---|---|
| | (Referenced to August 31, 1982) | | |
| Exchange Value[1] | 17.00 | 18.25 | 23.50 |
| Transaction Value[1] | 19.10 | 20.30 | 24.30 |
| Conversion Value[2] | 0.90 | 1.00 | 1.10 |
| Loan Use Charge Rate[3] | 6% | 6% | 5½% |
| Near-Term Uranium Supply[4] | 1.7 | 2.6 | 7.2 |
| Near-Term Uranium Demand[5] | 0.16 | 1.0 | 4.0 |
| Near-Term Supply-Demand Ratio | 10.6 | 2.6 | 1.8 |
| Optimum Tails Assay[6] | .341 | .333 | .287 |
| Current Transactions[7]: | | | |
| Number of Transactions | 10 | 6 | 4 |
| Quantity of Material[8] | 2.2-4.4 | 1.9-3.9 | 3.4-7.0 |

[1]US $ per pound $U_3O_8$ equivalent
[2]US $ per pound U as $UF_6$
[3]Percent per annum
[4]Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds $U_3O_8$)
[5]Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds $U_3O_8$)
[6]Percent $U_{235}$
[7]Uranium transactions only; does not include loans or conversion transactions
[8]Millions of pounds $U_3O_8$, equivalent

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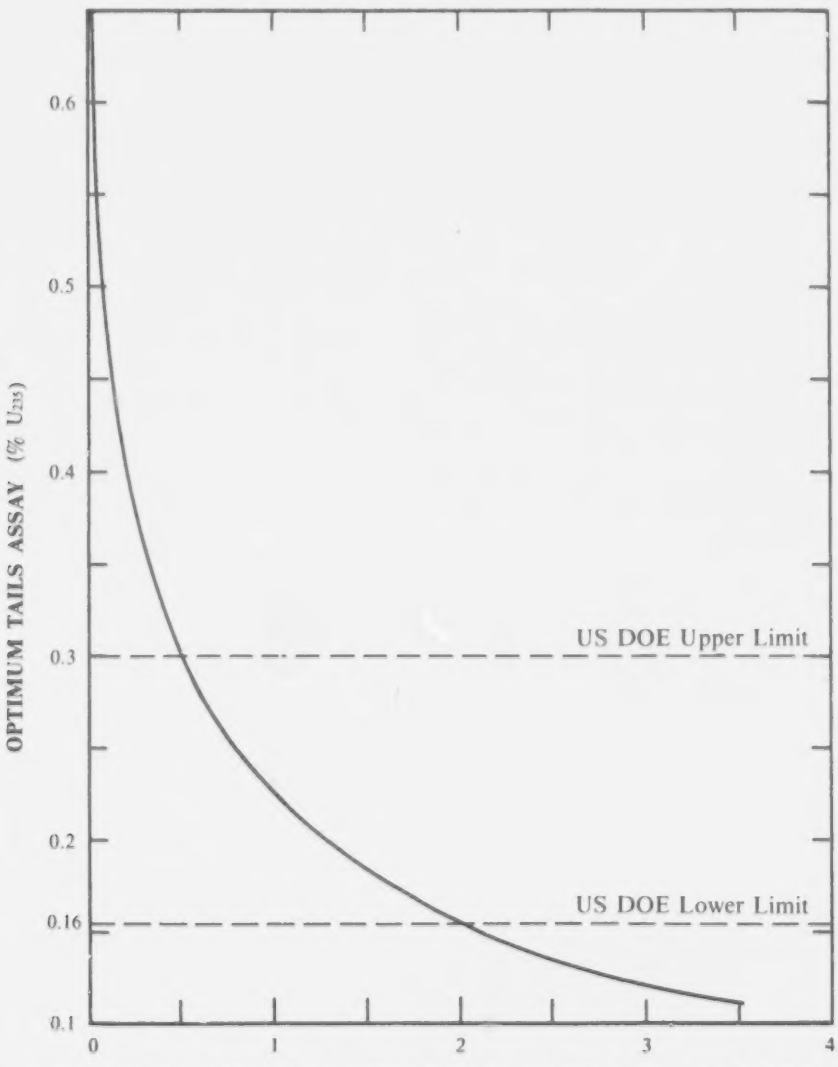
## OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of $UF_6$ to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent $U_{235}$. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

### TAILS ASSAY FOR MINIMUM COST OF PRODUCT

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## STANDARD ABBREVIATIONS

| | |
|---|---|
| ACTU: | Australian Council of Trade Unions |
| AEB: | Atomic Energy Board (South Africa) |
| AEC: | Atomic Energy Commission (US) (predecessor of NRC and DOE) |
| AECB: | Atomic Energy Control Board (Canada) |
| AFC: | Adjustable fixed commitment (swu contract) |
| AFR: | Away from reactor |
| AFUDC: | Allowance for Funds Used During Construction |
| AGR: | advanced gas-cooled reactor |
| BLWR: | same as BWR |
| BNFL: | British Nuclear Fuels, Ltd. (UK) |
| BWR: | boiling water reactor |
| CEA: | Commissariat a l'Energie Atomique (France) |
| CEGB: | Central Electricity Generating Board (UK) |
| CNEA: | Comision National de la Energia Atomica (Argentina) |
| COMINAK: | Compagnie des Mines d'Akouta (Republic of Niger) |
| DOE: | Department of Energy (US) |
| EEC: | European Economic Community |
| EIA: | Energy Information Agency (US) |
| EMR: | Department of Energy Mines & Resources (Canada) |
| ENEL: | Ente Nationale per l'Energie Elettrica |
| ENUSA: | Empresa Nacional del Uranio S.A. (Spain) |
| ERA: | Energy Resources of Australia |
| ESCOM: | Electricity Supply Commission (South Africa) |
| EdF: | Electricite de France |
| FBFC: | Societe Franco-Belge de Fabrications de Combustibles |
| FBR: | Fast breeder reactor |
| FRG: | Federal Republic of Germany |
| GCHWR: | gas-cooled heavy-water moderated reactor |
| GCR: | gas-cooled reactor |
| GNP: | Gross National Product |
| HTGR: | high-temperature gas-cooled reactor |
| HWLWR: | heavy water moderated boiling light-water-cooled reactor |
| IAEA: | International Atomic Energy Agency |
| INFCE: | International Nuclear Fuel Cycle Evaluation |
| JAURD: | Japan-Australia Uranium Resource Development Co. |
| JEN: | Junta de Energia Nuclear (Spain) |
| LGR: | light-water cooled graphite-moderated reactor |
| LMFBR: | liquid metal fast breeder reactor |
| LTFC: | Long-term fixed commitment (swu contract) |
| LWBR: | light-water breeder reactor |
| LWCHW: | light-water-cooled heavy-water-moderated reactor |
| MITI: | Ministry of International Trade and Industry (Japan) |
| MMN: | Metallurgie et Mecanique Nucleaires |
| MWe: | Megawatts of electricity |
| NAPOCOR: | National Power Corporation (Philippines) |
| NNPA: | Nuclear Non-proliferation Act (US) |
| NPT: | Treaty on Non-Proliferation of Nuclear Weapons |
| NRC: | Nuclear Regulatory Commission (US) |
| NSSS: | Nuclear Steam Supply System |
| NUFCOR: | Nuclear Fuels Corporation of South Africa Ltd. |
| OURD: | Overseas Uranium Resources Development Co., Ltd. |
| PHWR: | pressurized heavy-water-moderated and cooled reactor |
| PNC: | Power Reactor and Nuclear Fuel Development Corporation (Japan) |
| PSC: | Public Service Commission |
| PUC: | Public Utility Commission (US) |
| PWR: | pressurized water reactor |
| RAR: | Reasonably assured resources |
| RTZ: | Rio Tinto-Zinc Corporation Ltd. (UK) |
| SMDC: | Saskatchewan Mining Development Corporation (Canada) |
| SOMAIR: | Societe des Mines de l'Air |
| SSPB: | Swedish State Power Board |
| SWU: | Separative Work Unit |
| THTR: | thorium high-temperature reactor |
| TMI: | Three Mile Island (US) |
| TVA: | Tennessee Valley Authority (US) |
| UEGA: | Uranium Enrichment Group of Australia |
| UK: | United Kingdom |
| URDC: | Uranium Resources Development Corp. (Japan) |
| USBLS: | United States Bureau of Labor Statistics |
| VTAO: | Variable tails option (swu contract) |
| WOCA: | World outside communist areas |
| FIFO: | First in, First out |
| LIFO: | Last in, First out |

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## NUEXCO REPORT 169
## EXECUTIVE SUMMARY

**Exchange Value Drops $1.25, to $17.00**

The **Exchange Value** as of August 31, 1982 is $17.00 per pound $U_3O_8$. Sellers continued their spirited competition for the few sales opportunities.

**Near-Term Supply Decreases Slightly, Near-Term Demand Declines Sharply**

*Active* sellers in the zero to one year time frame are offering 1.7 million pounds $U_3O_8$, down from 2.6 million pounds last month. *Active* uranium demand in the zero to one year time frame decreased sharply, to only 160 thousand pounds $U_3O_8$.

**Supply-Demand Imbalance Continues**

The ratio of near-term supply to near-term demand increased 10.6:1 this month. The past three months' wild swings in that ratio (9.5 to 16.2 to 2.6 to 10.6) are the direct result of the market's thinness. Because there are so few active participants, the actions of one buyer or one seller can have disproportionate effects on spot and near-term prices. This unstable market has the potential for sharp price movements.

**Transaction Value Declines $1.20 to $19.10**

The **Transaction Value** as of August 31, 1982 is $19.10 per pound $U_3O_8$. It includes 14 transactions totaling 2.3 million pounds $U_3O_8$ and covers a period of four months.

**Ten Uranium Sales**

Ten uranium sales are reported this month. The total quantity falls in the range of 2.2 million to 4.4 million pounds $U_3O_8$.

**Conversion Value Drops Ten Cents to $0.90**

The **Conversion Value** as of August 31, 1982 is $0.90 per pound U as $UF_6$, down ten cents from last month. One conversion transaction is reported. Active sellers are offering 2.6 million pounds U as $UF_6$ in near-term conversion services, while active demand amounts to only one-fourth as much.

**Europe**

In the **Federal Republic of Germany (FRG)** two recently issued construction permits could signal the end of the five-year de facto moratorium on new nuclear construction. The two units, Isar 2 and Emsland, bring to ten the number of FRG nuclear units under construction.

In **Spain**, Asco 1 has cleared the final hurdle before fuel loading and startup.

In the **United Kingdom**, five new sites for nuclear stations have been named.

**Far East**

**Japan** energy think tank confirms Nuexco's published opinion that official government targets for additions to nuclear generating capacity are too optimistic.

**United States**

1. Plateau shuts down and Kerr McGee cuts back 30 percent.
2. Full power license for LaSalle Unit 1.
3. Allens Creek nuclear unit cancelled, two others delayed.
4. Thirty-five of the US nuclear units under construction or on order as of the end of 1981, approximately 36 percent, experienced zero or negative construction progress during the first half of this year.
5. USNRC expected licensing schedule presented and compared to Nuexco forecast.

**Essay**

The fear of "missing the boat" again on uranium sales concerns Australian producers. The *Essay* presents an Australian perspective on uranium pricing.

**Market Analysis**

DOE annual "Survey of US Marketing Activity" is summarized.

**Raw Materials**

Describes uranium occurrences in Sweden.

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